# Intracellular and Extracellular Pigments

Th. lecture 5

2023-2024

# Pigments

Pigments are colored substances, some of which are normal constituents of cells (e.g., melanin), whereas others are abnormal and accumulate in cells only under special circumstances

# Pigments

**Pigments can be either:**

1. Endogenous: It synthesized within the body itself, such as bilirubin, melanin, and certain derivatives of hemoglobin.
2. Exogenous: It coming from outside the body, such as carbon particle and tattooing.

| ***Endogenous pigments*** | ***Endogenous pigments*** |
| --- | --- |
| Bilirubin | Carbon (anthracotic) |
| Melanin | Tattooing |
| Hemosiderin | Arsenic |
| Hemoglobin derived pigments | b-carotene |

# Melanin

- Melanin is an endogenous, brown-black pigment.
- It is produced by the melanocytes through the oxidation of tyrosine by the enzyme tyrosinase.
- Normally, it is present in the hair, skin, mucosa at some places, choroid of the eye, meninges and adrenal medulla.

# Melanin

## Generalized hyperpigmentation

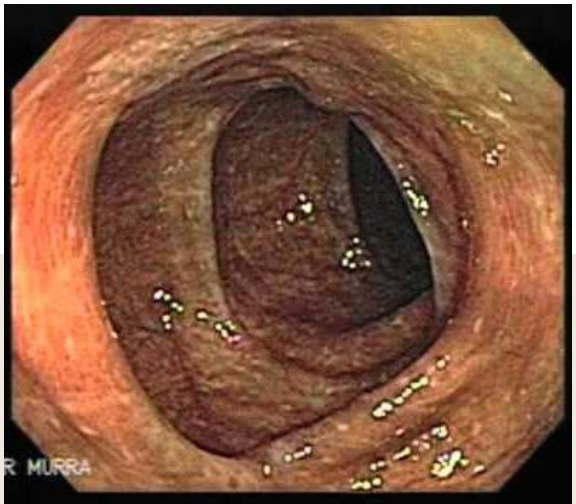
**Chloasma:**
Hyperpigmentation on the skin of face, nipples, and genitalia during pregnancy.

**Freckles** are flat small tan or light-brown spots on sun-exposed skin.

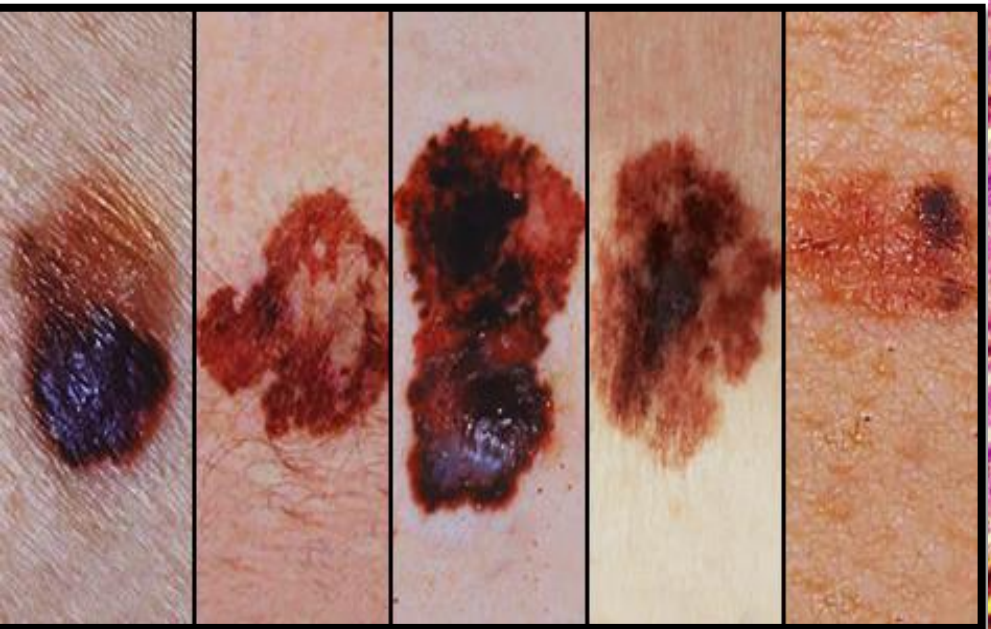
## Focal hyperpigmentation

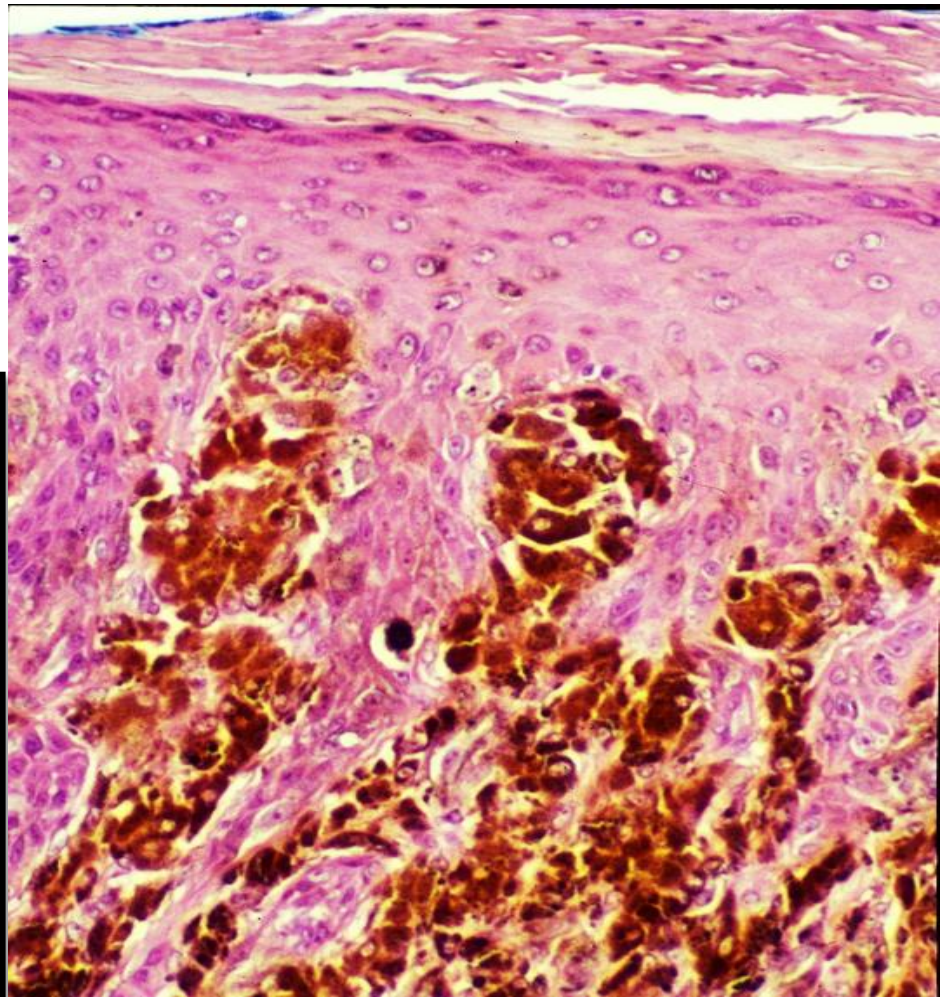
**Tumors of melanocytes: Benign(nevi) and malignant (melanoma) tumors**

**Melanosis coli:**
Pigmentation of the mucosa of the colon



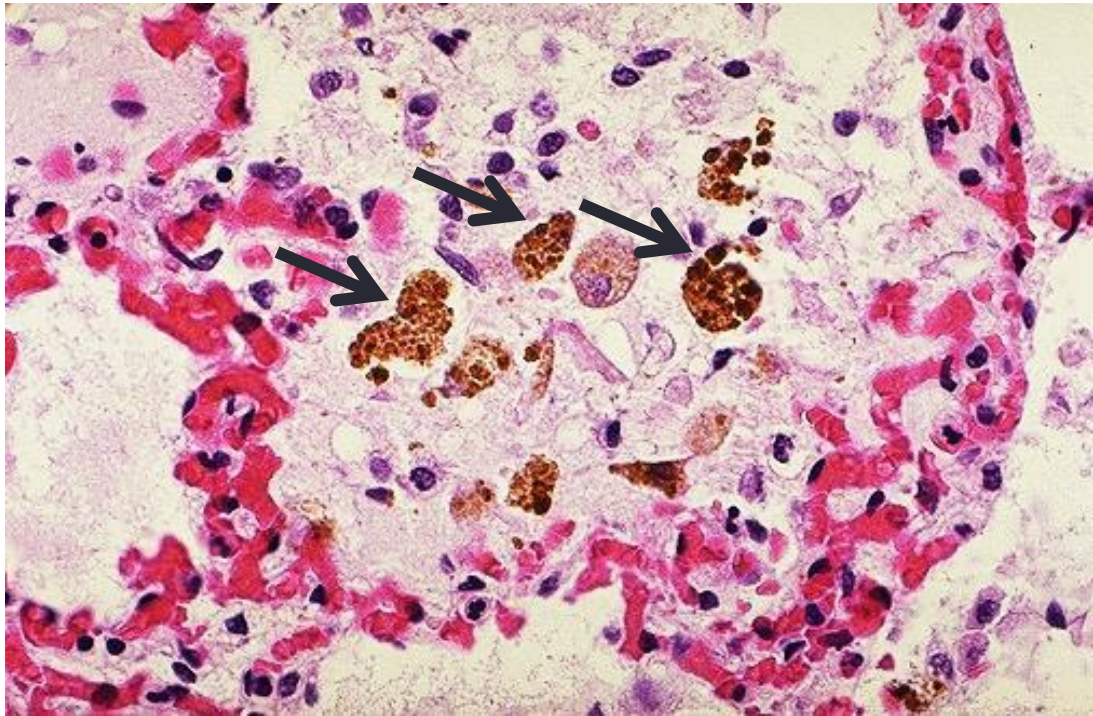
# Melanoma; malignant tumor





# Hemosiderin

The hemosiderin is a term refers to hemoglobin-derived, golden-yellow or golden-brown granules seen intracellular.



# Hemosiderin

**Causes:**

Local or systemic excess of iron cause hemosiderin to accumulate within cells.

- Local excesses e.g. Bruise
- Systemic excesses: Systemic overload of iron is known as hemosiderosis.

# Hemosiderin

**The main causes:**

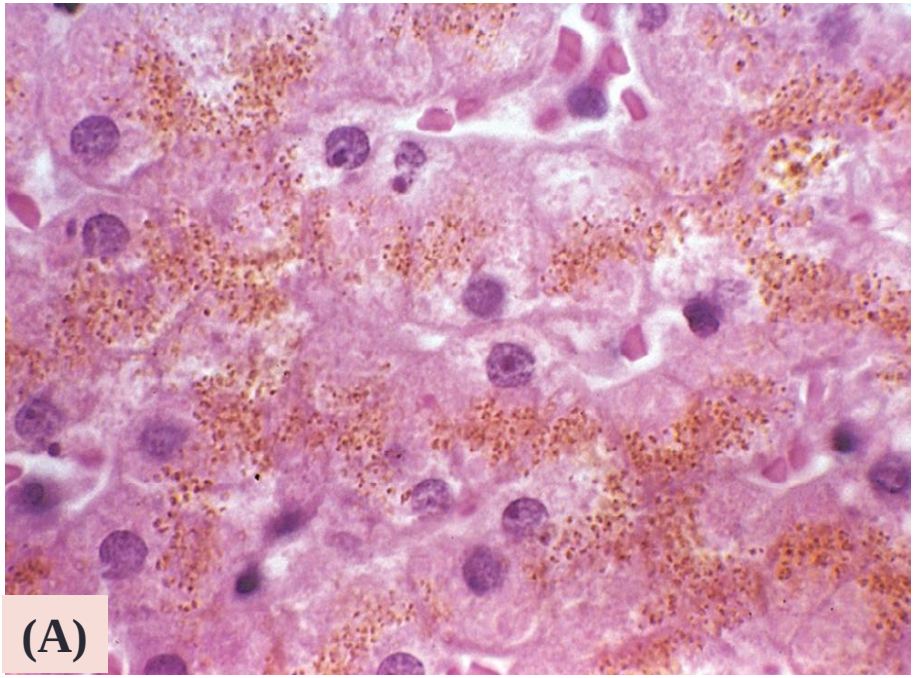
1) Increased absorption of dietary iron.
2) Excessive destruction of red cells: For example, hemolytic anemias.
3) Repeated blood transfusions.

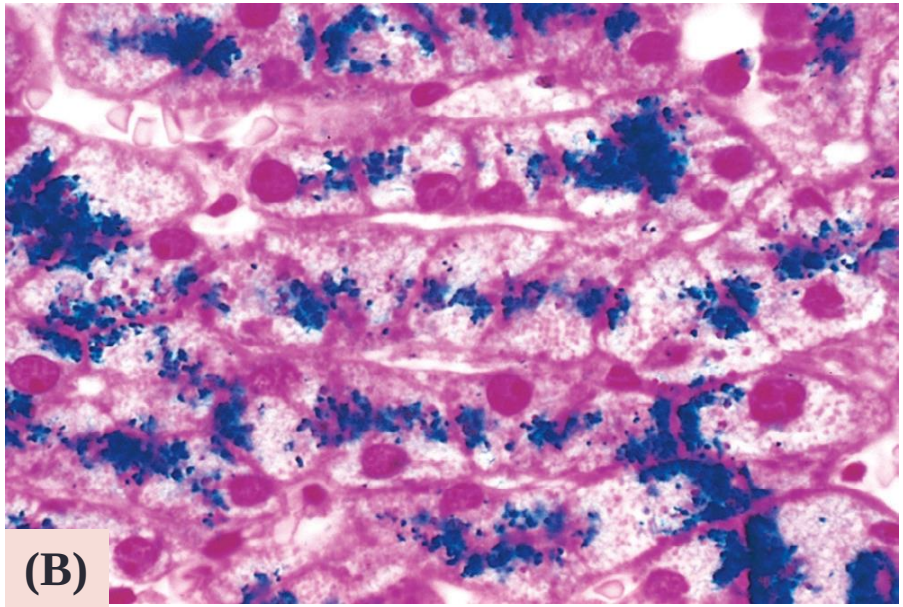
# Morphology

- Found in liver, bone marrow, spleen, and lymph nodes.

Microscopy: Appears as a coarse, golden, granular pigment within the cytoplasm.

Special stain: Prussian blue (Perl’s stain).



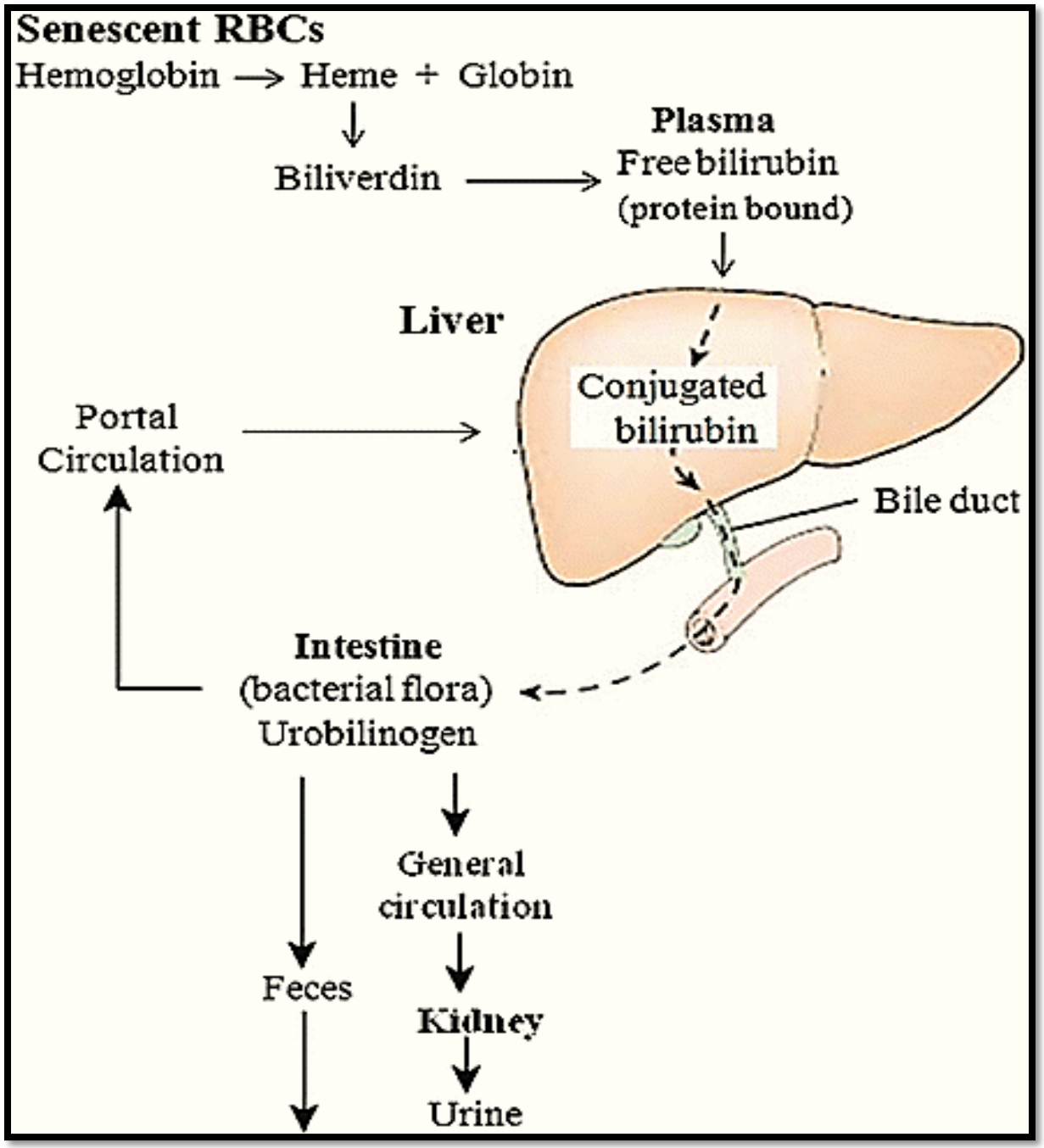

**Hemosiderin granules in liver cells.**

(A) Hematoxylin & eosin stained section showing golden-brown, finely granular pigment.

(B) Iron deposits shown by a special staining process called the Prussian blue reaction.

# Bilirubin

The bilirubin is the major pigment of the bile. It is derived from the hemoglobin but it contains no iron. The conversion of bilirubin to bile occurs within the hepatocytes.




# Bilirubin formation

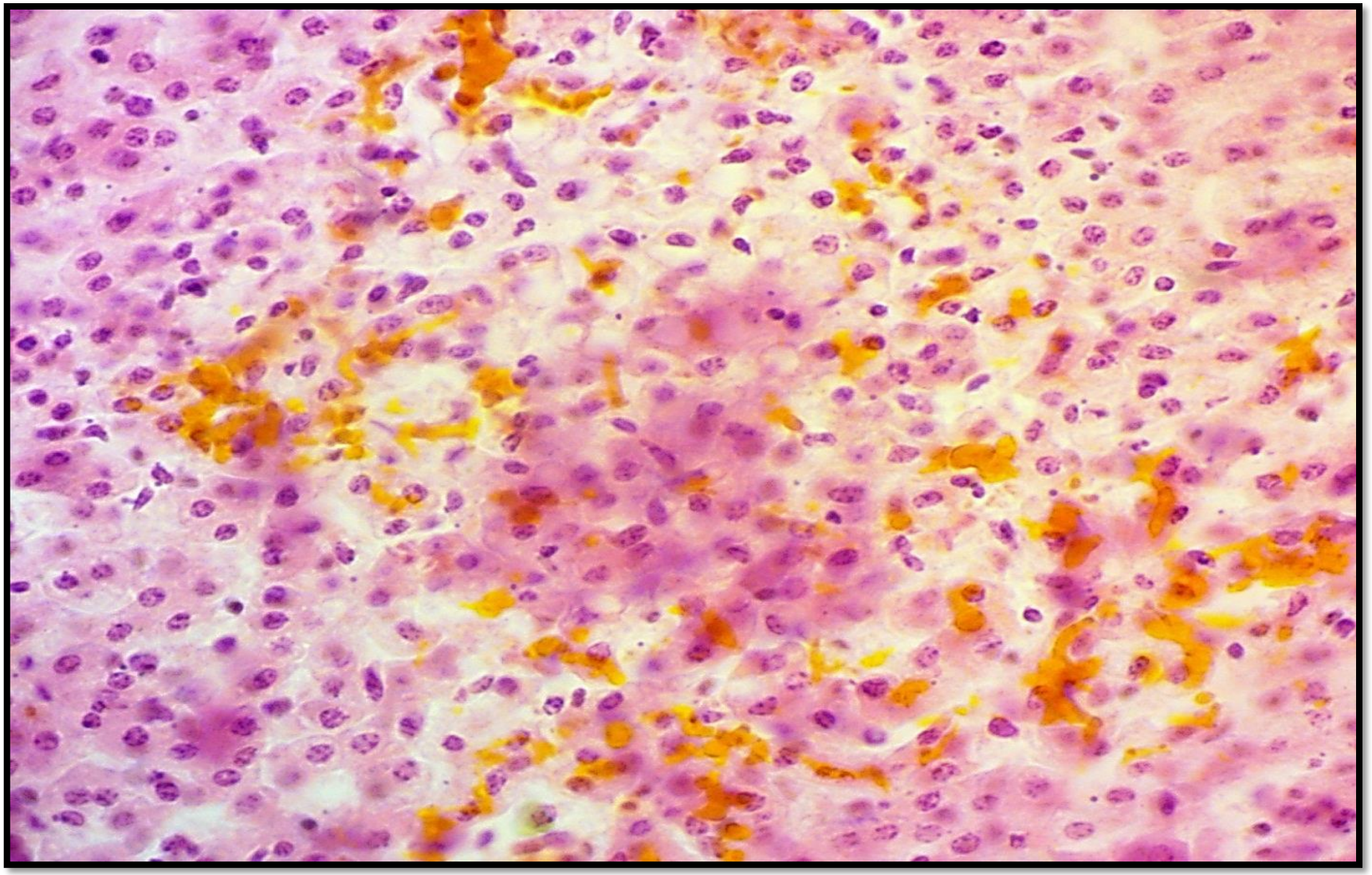
# Bilirubin

Pathological accumulation of the bilirubin within cells of all tissues and within body fluids is referred to as jaundice or icterus which is characterized by yellowing of the skin, mucous membranes and the sclera of the eyes.

# Bilirubin

- Pathological accumulation of the bilirubin in the liver, occur when there is an obstruction to the bile flow (e.g., obstruction of the common bile duct by a stone).
- This deposition of the bilirubin gives greenish color to the liver grossly.

# Liver, Bilirubin pigments



# Exogenous pigments

Exogenous pigments are the pigments introduced into the body from outside such as by inhalation, ingestion or inoculation.

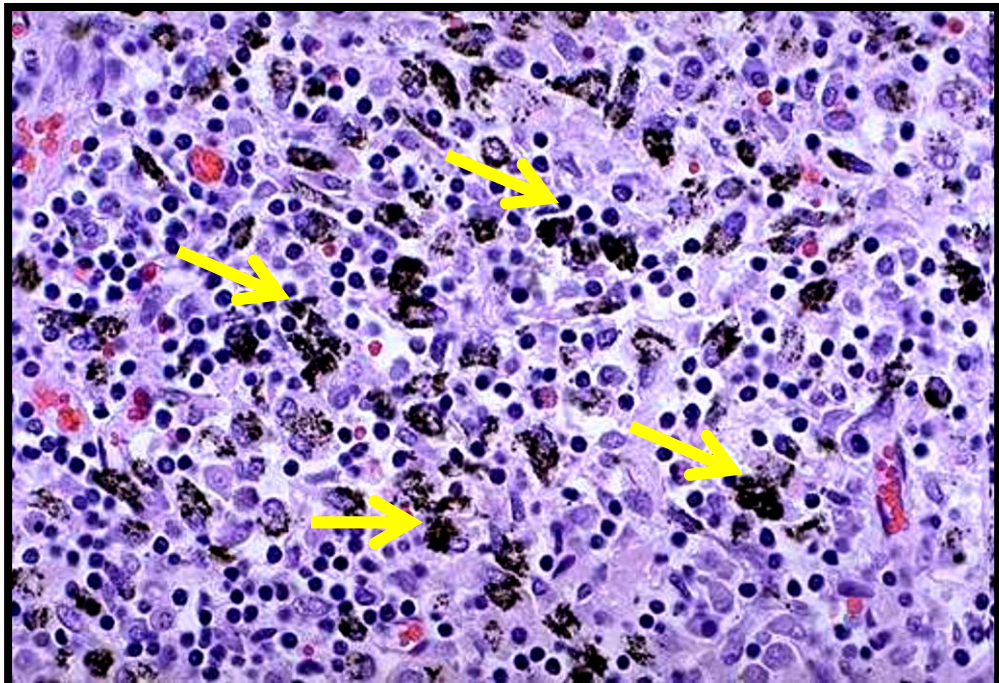
# Exogenous pigments

## Coal dust particles (Carbon):

- The most common exogenous pigment is carbon, a ubiquitous air pollutant of urban life.
- When inhaled, it is phagocytosed by alveolar macrophages and transported through lymphatic channels to the regional lymph nodes.
- Aggregates of the pigment blacken the draining lymph nodes and pulmonary parenchyma (anthracosis).

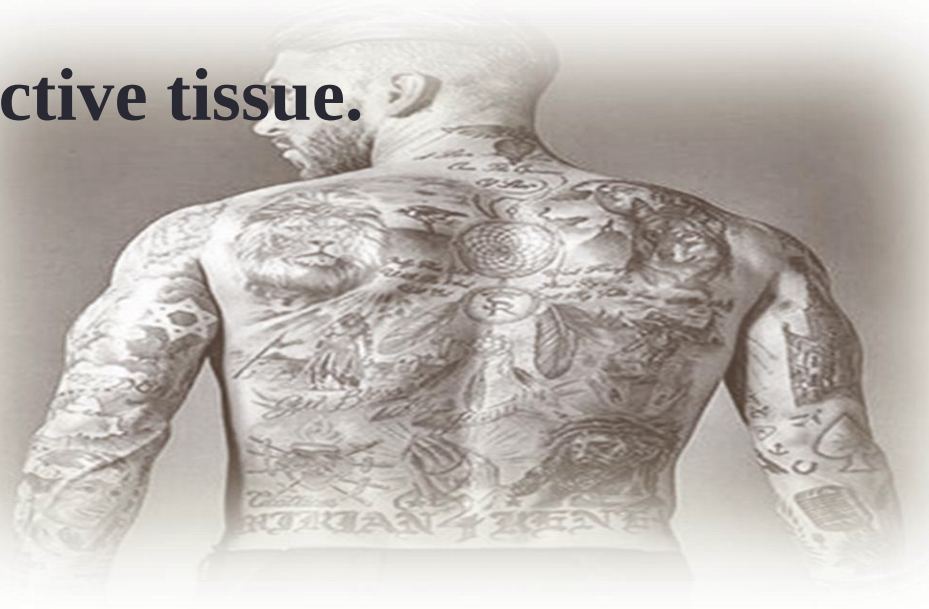
# Anthracosis

Aggregates of the pigment blacken the draining lymph nodes and pulmonary parenchyma

# Tattooing

**Pigments like India ink, cinnabar and carbon are introduced into the dermis in the process of tattooing where the pigment is taken up by macrophages and lies permanently in the connective tissue.**



**Black pigment granules are seen within the dermis.**

**Diagnosis: Tattooing**